

# Alternative Transportation System Demand Estimation for Federal Land Management Agencies

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## I. INTRODUCTION

Estimating travel demand for alternative transportation systems (ATS) is challenging in any context, but is even more daunting for Federal Land Management Agencies (FLMAs). Federal public land sites vary widely in their characteristics. Moreover, travel by visitors to, from, and within FLMAs often has little resemblance to the more common types of transportation for which traditional demand modeling methods have been developed.

This report therefore does not seek to quantify demand for ATS on federal lands with any great level of specificity; rather, the report provides general guidelines for agencies and their sites to consider when either deciding what type of vehicles or infrastructure is needed or when deciding how to develop a service that meets the needs and expectations of both the site staff and the site visitors.

Alternative transportation encompasses several different modes, including buses, ferries, and bicycle and pedestrian infrastructure. While this study is intended to have some applicability across modes, examples given are primarily bus services. Bus services, in particular, require a significant up-front investment, and accurate demand estimation is critical to their long-term sustainability.

This report is written predominantly for prospective applicants to capital investment programs such as the Paul S. Sarbanes Transit in Parks (TRIP) Program, and for federal public land site staff with the authority to make decisions pertaining to the procurement and operations of alternative transportation assets.

The information contained in the study will ideally help these stakeholders make more informed decisions to address the alternative transportation needs unique to their own situations.

### Structure of This Report

Chapter II reviews traditional models for estimating transportation demand. It introduces the “four-step model” that is usually applied for transportation systems with extensive data available to support the modeling effort. The chapter also describes the factors that make a public lands setting different from traditional transportation agencies, and therefore why traditional modeling techniques may be less applicable for FLMAs.

Chapter III introduces the data tools and approaches available that are better tailored to the needs of FLMAs. Following a brief introduction to the different types of data that are available, the chapter describes both the data sources and collection methods that will greatly aid federal public land sites as they begin to approach ATS demand estimation.

The following three chapters describe some of the key considerations associated with ATS demand on federal public lands: service considerations, visitation considerations, and site-specific considerations.

Finally, the report concludes with a framework in the form of a matrix that summarizes the key factors of importance to different visitors when deciding whether or not to utilize a voluntary ATS service. The matrix describes such factors as scheduling, accommodations, fare, and destinations served.

## II. TRADITIONAL DEMAND ESTIMATION APPROACHES FOR ALTERNATIVE TRANSPORTATION

Demand forecasting outside of the FLMA context typically incorporates the demographics, economics, geography, and travel network for the area under study. This is often done for urban, suburban, and rural transit systems. In order to predict demand for any particular service or facility, it is first necessary to predict overall travel demand and travel patterns in the area. Federal public land sites generally will not have the resources or the need to do such in-depth analyses; however, it is still important that the sites are familiar with the traditional techniques to better understand their methodologies, outputs, and overall relevance to FLMA transportation issues.

For systems that are already in operation, there may be valuable data available on current usage patterns. This provides an excellent starting point for forecasting the effects of minor changes to the system, since the overall level of demand does not need to be estimated from scratch. The forecasting effort can instead focus on small adjustments to demand. This method is often called **Pivot Point Analysis**.

For new systems or for major changes to current systems, usage data may be non-existent. In this case, overall demand must be estimated using basic information about the area and the travel network. This kind of forecasting effort is often complex and labor-intensive. There is much room for error, and a great deal of validation and calibration is usually required. This method is referred to as **Synthetic Modeling**.

### Pivot Point Analysis

Pivot Point Analysis greatly reduces error by using real data in place of calculations and assumptions. Using current demand as a basis, forecasters estimate incremental changes in demand due to proposed changes in service characteristics. For relatively small service changes such as minor schedule expansions or fare increases, proportional measurements called **elasticities** can be used to calculate changes to demand.

Elasticity simply represents the extent to which a particular variable responds to a change in another variable. Demand elasticity is a measure of how much change in demand can be expected as a result of a change in service. For example, if a 10 percent bus fare increase causes riders to take 5 percent fewer bus trips, the price elasticity of demand is -5 divided by 10, or -0.5. This suggests that every 1 percent increase in fare will drive away 0.5 percent of business. Elasticities are always calculated in terms of percent change, so units of measure are not relevant.

Elasticities are typically calculated from existing data, either from the area under study or from other areas. Traveler surveys may also play a role, but their accuracy is often questioned, and actual travel data are usually considered preferable. Many elasticities, such as the effect of urban bus fares on bus demand, have been extensively studied and fairly reliable estimates are widely available.

The pivot point method is less effective in analyzing more dramatic or comprehensive changes to service. The effects of such major changes may not be proportional to those of smaller changes, and the combined effects of multiple changes often require a more involved forecasting effort.

## Synthetic Modeling

In analyzing a completely new service, or comprehensive changes to existing service, information about present demand for the new or redesigned service may be extremely limited or nonexistent. It is therefore necessary to estimate demand using more basic data – typically geographic, demographic, and economic information about the area under study.

In a synthetic model, these data are used to estimate the total number of trips, where the trips are going, what mode of travel they use, and what routes they take.

## Four-Step Process for Modeling Travel Behavior

Synthetic models usually follow a standard four-step modeling process. The basic approach is to represent the area under study as a network of road links connecting various locations or zones. The characteristics of each zone are used to estimate the number of trips beginning and ending in the zone, and these estimates are used to generate hypothetical “trips,” each with a specific route. These trips can be counted to estimate the demand for specific services, roads, or areas – or even demand for an entire network.

More specifically, the four steps of the process are:

1. **Trip generation** – estimates the total number of trips starting and ending in each zone based on the types of places and number of people located within the zone.
2. **Trip distribution** – matches up trip start and end locations (origins and destinations) to create a large number of individual trips.
3. **Mode choice** – determines the proportion of trips that will use each mode. Common modes include driving alone, carpooling, public transit, walking, and cycling.
4. **Route assignment** – determines the exact route each trip will take.

The result of the four-step process is a detailed estimate of travel demand on each route and each mode across a network. The process can be carried out fairly simply by making sweeping assumptions, or it can be executed with sophisticated models using fine-grained details about the network, travelers, and transit services. As with any form of prediction, the accuracy of the estimates depends on the quality of the inputs and the assumptions made at each step.

## **Applicability of Traditional Transportation Demand Modeling in a Public Lands Context**

While many aspects of urban and suburban transportation demand are well-understood and well-tested, forecasting demand in public lands presents unique challenges that often fall outside the scope of traditional forecasting. Traditional demand estimation techniques reflect years of experience and research for transportation networks outside of FLMA's. This section addresses the major differences between general transportation and transportation at federal public land sites.

## Network

One of the most fundamental differences is the type of travel network under study. Traditional demand forecasting typically considers large, complex networks, with a variety of location types (e.g. commercial, industrial, and residential). The level of detail achievable in a forecasting effort depends largely on the data and computational resources available.

FLMA networks, by contrast, are often much simpler, consisting of a few specific destinations and access routes. This reduces or eliminates the need for any elaborate efforts toward trip generation, trip distribution, or route assignment. It also changes the type of information most useful to the forecasting effort, since it allows for the direct use of highly specific data, such as visitation to particular site on a particular day of the week.

### Visitation

On any given day, visitation to a federal public land site is typically much less than the traveling population of an entire city or area. Additionally, the FLMA visitors' destinations and trip purposes are usually much more limited. This means that the travel population can be defined much more narrowly in the FLMA context, without the need to account for a wide variety of traveler characteristics.

For example, a site that offers a campground and a scenic waterfall can safely assume that most visitors heading for the campground will stay in that location much longer than will most visitors heading for the waterfall. This knowledge could greatly improve the scheduling of bus service to the two sites.

Visitor interests may also differ greatly in the FLMA context. Since travelers typically visit a federal public land site in their leisure time, they tend to behave and make choices differently from travelers who are commuting to work or otherwise going about their daily lives. They may, for instance, be more tolerant of delays and infrequent service, since tardiness is less problematic in leisure time than while commuting daily.

### Data

Urban transportation forecasters can often rely on large amounts of timely data from their area. Most cities and towns regularly collect information on their residents, businesses, and travel patterns for various purposes including transportation planning.

FLMAs, on the other hand, have widely varying data collection practices, and some may not have had the need or ability to collect important transportation-related data. For this reason, transportation planners at FLMAs must often cope with limited or tangential data. This limitation requires careful adaptation of forecasting methods, and at times might preclude traditional demand forecasting altogether.

### Cost and Resources

Urban transportation planning is often a large-scale effort, involving modelers, politicians, analysts, economists, and other experts working together to develop a thorough understanding of complex travel patterns. Few federal public land sites have access to the resources, both technical and financial, to undertake a traditional modeling effort.

### Summary

Overall, site staff must be careful in applying traditional demand estimation techniques to public lands. The next chapter provides an overview of types of data which can be used to estimate demand for ATS on federal lands.

### III. DATA TOOLS AND APPROACHES FOR ESTIMATING ATS DEMAND ON FEDERAL LANDS

In most cases, forecasting demand for transportation systems in public lands need not be nearly as complex as in the traditional context. Travel networks are much smaller and simpler, often serving only a few major points of interest. The traveler population is much smaller as well, and can be more easily studied through visitor surveys, traffic counts, and other data collection efforts.

The uniqueness of each federal public land site presents a challenge in that data and experience from other sites or more traditional transportation applications may be of limited use or relevance. The particular attractions and services offered at each site can have a major impact on visitors' travel behavior, and must be considered carefully in every step of the planning process. Knowledge about the visitors who come to a federal public land site is one of the most fundamental aspects of any forecasting effort. The needs, characteristics, and preferences of the visitors must be understood in order to estimate transportation demand.

Relevant, high-quality data are essential in developing accurate estimates of demand for transportation services. For federal public land sites, identifying and collecting the most useful data can be a challenge. However, there are many different types of data available for analysis, such as quantitative data collected through field studies and visitor surveying, and qualitative data gathered from the anecdotal experiences of staff and visitors. Viewed together, these data may help indicate the viability of introducing alternative transportation services within or nearby a federal public land site.

Collecting certain kinds of data may require much time and money, either or both of which may be scarce for federal public land sites. Fortunately, a number of tools can help contribute to data collection at relatively low cost and minimal effort, a key consideration for those sites with little or no prior data to draw upon. This section highlights some of these tools, how they are administered, the types of data they reveal, and the benefits of that data.

#### Types of Data Sources

##### Quantitative vs. Qualitative

**Quantitative data** can be expressed using numbers. Properly collected quantitative data can be of immense value, providing clear and objective insights into the questions at hand. It is often very easy to apply calculations and models to quantitative data, but great care must be taken to interpret the data and results realistically and avoid unfounded assumptions.

**Qualitative data** refers to any information that cannot be expressed numerically, such as observations, opinions, and general attitudes. While this type of data can be controversial or difficult to apply since it is inherently subjective, it can provide critical understanding of the situation, and can even clarify other data.

##### Revealed Preference vs. Stated Preference

**Revealed preference** data describe actual recorded behavior of travelers. Some examples include traffic counts, visitation numbers, and parking occupancy. Revealed preference data is considered highly valuable since it reflects the present reality without speculation or conjecture. It is extremely useful in

assessing existing services and minor to moderate changes to service. It may be less relevant when analyzing proposed new service or major changes to service.

Certain kinds of revealed preference data are often readily accessible since they are important to other aspects of site management. Visitation data, for example, is collected in great detail at many sites, regardless of transportation planning efforts.

**Stated preference** data describe travelers' *likely* behavior, typically determined from survey questions, focus groups, or other inquiries. Stated preference data is typically considered less reliable than revealed preference data, since it requires travelers to consider hypothetical situations and predict their own behavior. For instance, respondents may think they would use an environmentally-friendly bus service, but in reality may not choose to do so if faced with longer travel times or inclement weather.

For this reason, it is extremely important to remember that stated preference data is usually imprecise and circumstantial. While the data can be very helpful in a larger demand estimation effort, it is generally ill-advised to make exact calculations or predictions based on stated preference data alone.

One advantage of stated preference data is that it can be very specifically tailored to the needs of the project at hand. For example, a survey can describe two proposed bus services to visitors and ask which they would prefer. In this way, a site can "try out" a new service on paper before actually committing to it.

Detailed, precise communication is essential for effective stated preference data collection. If questions are unclear or visitors' responses are not adequately documented, the information collected can become inaccurate or incomprehensible. Carefully planned collection efforts, however, can yield valuable and specific feedback.

Another common challenge in collecting stated preference data is obtaining responses from a representative sample of visitors. While revealed preference data simply records the normal behaviors of visitors, stated preference data requires deliberate effort from visitors to provide feedback. The data therefore comes only from visitors who are willing and able to respond. This group may have very different preferences from the population at large, introducing bias into the results. This difficulty can be addressed by minimizing the burden on respondents and actively seeking responses from underrepresented groups.

## Visitation Data

One of the most fundamental types of knowledge about a federal public land site is the level of visitation it experiences. As discussed below, detailed visitation data is particularly valuable for planning alternative transportation systems.

Since visitor data is essential to many aspects of site management, substantial visitor data may already be available at many sites. In this case, obtaining data may be trivial, but the data may only be of peripheral relevance to transportation. New data collection efforts might be necessary if the existing data are not detailed or relevant enough for demand forecasting.

### Time Distribution of Visitation

While yearly visitation numbers give a good idea of the overall volume of travelers, a finer time scale is essential to ATS planning. Identifying and measuring variations in visitation as they occur over the course of a day, week, month, or year provides an understanding of fluctuations in demand.

Sites can use this information to offer alternative transportation services, such as a transit service, at lower or higher frequencies when visitation levels call for it. Visitation data also helps establish the extent of the need for alternative transportation improvements. For example, sites that are able to accommodate visitation levels throughout most of the service season, save for a few days, would likely determine that there is no need to introduce a transportation system which may largely go underutilized.<sup>1</sup>

### Site-Specific Visitation

Internal visitation patterns, or how visitors move between attractions within a site, can also be important in planning alternative transportation services. These data portray how visitors choose to travel between attractions at a site and may indicate whether an alternative mode of transportation would better facilitate movement within a site. Visitor surveys may indicate visitor preferences for the transportation options available to them.

### Visitation numbers

Collecting visitation data can be easier for sites that control admission – for example, via recreation enhancement fees for vehicles or walk-in visitors – as these sites can use the admission process to count visitors. However, sites without controlled admission must often manually count vehicles or persons, a process which can cost many hours of staff time.

Usually, such a data collection process cannot feasibly be carried out over the entire course of a service season. Instead, it is standard to collect data several times during key periods of visitor activity. For example, a site might count parking lot occupancy on one weekend day and one weekday for two weeks of every month. While limited, the data would give some insight into seasonal variations and the magnitude of a weekend visitation peak.

In collecting and analyzing the data, it is important to account for normal peak periods and short-term external factors, such as weather conditions or gas prices, which can drastically affect these figures. When using visitation data to predict trends, the quality of the prediction depends heavily on the amount of historical data used. A trend projected from a single year of historical data is effectively meaningless, but trends calculated from many years of consistent data can yield extremely reliable predictions. A minimum of ten years of historical visitation data is recommended for calculating a reliable rate of growth. Broader societal factors, such as shifting demographics, can also influence future data projections.<sup>2</sup>

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<sup>1</sup> Federal Transit Administration. *Transportation Planning Process in Transit in Federal Land Management Agencies*. [http://www.triptac.org/Documents/RepositoryDocuments/tran\\_pl\\_guide\\_vol2.pdf](http://www.triptac.org/Documents/RepositoryDocuments/tran_pl_guide_vol2.pdf), p. 2-16.

<sup>2</sup> Federal Transit Administration. *Transportation Planning Process in Transit in Federal Land Management Agencies*. [http://www.triptac.org/Documents/RepositoryDocuments/tran\\_pl\\_guide\\_vol3.pdf](http://www.triptac.org/Documents/RepositoryDocuments/tran_pl_guide_vol3.pdf), p. 8-5.

## Facility Data

### Parking

**Parking lot occupancy** refers to the total number of vehicles parked at a given time. This is sometimes stated as a proportion of total parking spaces, to indicate the level of crowding. Occupancy can be determined in various ways, for example by tracking entrances and exits or by counting parked cars or empty spaces. While occupancy is often assessed at hourly intervals, providing knowledge of parking patterns over the course of a day, the predominant usage of the lot will determine the appropriate interval. For example, occupancy for a busy visitor center lot should be measured more frequently than one used largely by day hikers. High occupancy rates are an indication that parking supply is limited, although the total demand for full parking lots can only be ascertained by also counting the number of vehicles turned away.

**Parking lot turnover** is the frequency with which vehicles leave the lot and others enter. This information can be critical in predicting parking lot crowding during peak visitation. This can be measured in terms of the number of cars that enter and/or exit a parking lot within a given timeframe.

Vehicle turnover rates can be determined by tallying license plate numbers at various intervals of a day, or, for more precise measurements, as vehicles enter and exit a parking area. This figure can be valuable in determining whether parking areas are being used efficiently. For example, low turnover rates may indicate the use of parking areas by employees or long-term users such as hikers, creating less available space for short-term users. The provision of alternative parking areas or alternative transportation services for different types of users can help alleviate the issue.

### Roadway

Federal public land sites which allow vehicular traffic can use a number of different analysis techniques to evaluate how effectively internal and external roadways are serving motorists and whether alternative transportation is necessary. Traffic counts, level-of-service assessments, and vehicle occupancy rates are examples of data which provide an understanding of how visitors are using roads.

**Traffic counts** measure the number of vehicles traveling through a particular stretch of road, typically in 15-minute intervals. They can be collected manually by individuals positioned at a site, or through traffic counting devices such as loop detectors or pneumatic tubes. Traffic count data is useful in establishing the level of roadway usage for a day, week, month, or service season. These figures provide a quantitative understanding of issues like overuse and congestion, which may in part justify the introduction or expansion of a transportation service. Short-term external factors like weather and fuel prices can influence traffic levels and negatively impact the reliability of the data. The collection of data over a long period of time can help provide perspective on short-term trends.<sup>3</sup>

**Level-of-service (LOS)** measures the relationship between traffic volumes and capacity on a particular roadway or intersection. The standard LOS scale rates the road with a grade letter, from A (little or no delay) to F (extreme delays). There are various ways to measure LOS for different types of roadway, with many states and localities adopting differing standards. LOS can serve as a quantifiable and accountable

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<sup>3</sup> Federal Transit Administration. *Transportation Planning Process in Transit in Federal Land Management Agencies*. [http://www.triptac.org/Documents/RepositoryDocuments/tran\\_pl\\_guide\\_vol3.pdf](http://www.triptac.org/Documents/RepositoryDocuments/tran_pl_guide_vol3.pdf), p. 9-6.

way to estimate the severity of congestion on a roadway, although grades for minor roadways are usually not measured.<sup>4</sup>

Depending on the jurisdiction and importance of the road, an LOS grade may already be on record at a local Metropolitan Planning Organization (MPO), state Department of Transportation (DOT), or parent agency of the site. Since federal public land sites do not typically specialize in technical roadway assessments, they should refer to these outside entities for LOS data.

**Vehicle occupancy** refers to the average number of persons (including the driver) in each private vehicle. This information is essential in determining the number of visitors traveling by private vehicle, as well as overall visitation numbers.

More directly, vehicle occupancy rates indicate the level at which visitors are carpooling. A low occupancy rate might suggest that efforts to encourage carpooling could be effective in reducing vehicle traffic. A high occupancy rate might suggest that visitors are already maximizing the use of their vehicles and might consider alternative transportation as an alternative.

### Transit

For sites with existing transit services, such as buses or ferries, operational and usage data are extremely valuable, especially when assessing proposed changes to the service. Even when considering a completely new service, data from existing transit systems at similar sites can be valuable.

**Ridership** is perhaps the most fundamental type of transit data, and measures the number of passengers using a service. Some ridership measures are very broad, such as riders per year, but others are very specific, such as riders per hour at peak times for a particular route.

Information about the times and places riders travel can provide insight into the popularity of particular attractions, seasonal changes in visitor behavior, and the performance of transportation services external to the site.

In analyzing ridership data, it is crucial to consider the other choices available to visitors. While the quality of a transit service certainly affects ridership, the quality of alternatives can also have a major impact. Ridership data can therefore provide important insight into the convenience of driving, walking, and other forms of travel available at the site.

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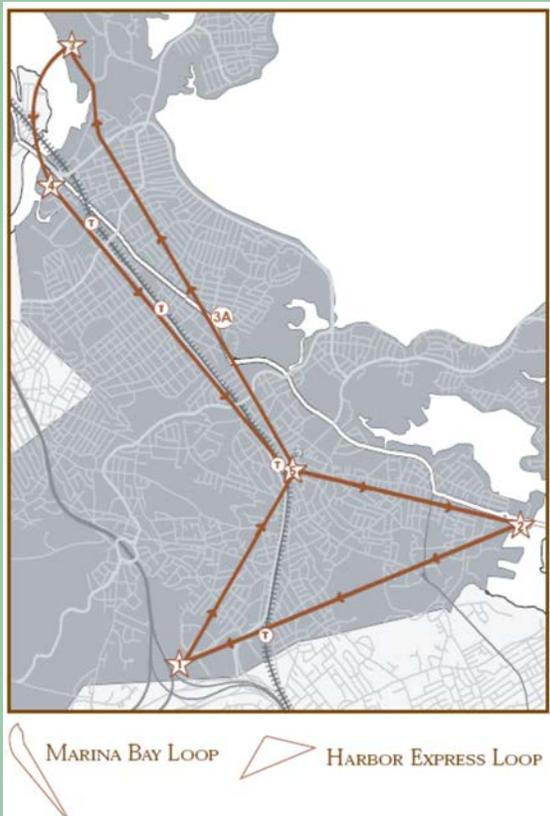
<sup>4</sup> Ibid.

## Adams National Historical Park

Adams National Historical Park consists of several sites located in Quincy, Massachusetts. The visitor center is located in the heart of Quincy and is easily accessible via public transit. From the center, visitors can use the park trolley service to reach sites of interest.

However, several nearby tourist destinations, including hotels, ferry terminals, and a shopping district, have no convenient access to public transit. In June 2006, Adams collaborated with area hotels to plan a new shuttle service to connect the park with these destinations.

The service began as a pilot project, with two separate loops serving the north and south sides of Quincy, respectively. The southern loop proved to be more popular, drawing more than twice as many riders as the northern loop. This finding helped shift the focus of future efforts toward the southern loop, since it was much more viable.



Map of expanded trolley services at Adams National Historic Park

<sup>5</sup> National Park Service. *Adams National Historical Park Expanded Transit Service Evaluation*. <http://www.volpe.dot.gov/coi/ppoa/publiclands/projects/docs/adams.pdf>, p. 7.

The proportion of visitors using transit is especially important in comparing alternatives. For example, if only 25% of visitors use transit at off-peak visitation hours, but 50% use it during peak hours, it is likely that crowded parking lots and congested roadways are convincing visitors to use transit during peak hours. An increase in overall ridership is expected during peak hours, but by comparing proportional ridership, the impacts of various factors on ridership become more evident.

## **Anecdotal Data from Visitors**

Anecdotal data are highly qualitative and sometimes subjective information that comes from the experiences of staff and visitors at a site. Although the term “anecdotal” is sometimes used to discredit data in a scientific context, the knowledge and opinions of those most familiar with a site can have immeasurable practical value.

### Visitor Surveys

Visitor surveys are a stated preference approach that can be used to collect very detailed information about visitors and their preferences. Important travel data such as origin, travel patterns, attitudes, and willingness to use ATS can be directly addressed with a survey.

There are many options for surveying visitors, including entrance or exit surveys, personal interviews, mail-back surveys, and even online questionnaires. It is important to note that surveys conducted on behalf of the federal government must first receive approval from the Office of Management and Budget (OMB).<sup>6</sup>

Transportation-related survey questions can also be distributed as part of larger surveys administered by the site. This can be a cost-effective way of getting visitor input on transportation-related issues as well as more general matters. Topics most relevant to ATS demand include trip planning information resources consulted by visitors, visitor familiarity with transportation options, willingness to use transit, and preferences for various transportation modes.

Surveys can be designed very effectively when the proposed changes to service are clearly defined and specific. This is because the questions can directly address the most important issues, rather than asking visitors about general topics that may be hard to apply to transportation issues. Without actually implementing any service, forecasters can “test out” different transportation alternatives with visitors. If the survey is designed well, the data can be used to predict demand for a range of services. Clearly conveying to visitors the purpose of the survey and the great value of their input can encourage more thorough and helpful responses.

As with many data collection efforts, a thorough survey effort can require substantial dedication of staff time and resources, which should be carefully accounted for in planning and budgeting a forecasting effort.

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<sup>6</sup> Federal Transit Administration. *Transportation Planning Process in Transit in Federal Land Management Agencies*. [http://www.triptac.org/Documents/RepositoryDocuments/tran\\_pl\\_guide\\_vol3.pdf](http://www.triptac.org/Documents/RepositoryDocuments/tran_pl_guide_vol3.pdf), p. 6-1.

### Travel Diaries

A travel diary is a log into which visitors record information about their trip locations, start and end times, routes used, and transportation services used. Since these require considerably more effort to complete than paper surveys, many respondents may choose not to participate or may return incomplete diaries.

However, the information collected from travel diaries can provide a very detailed insight into visitors' travel patterns, which can be extremely valuable in planning and forecasting for ATS.<sup>7</sup>

### Focus Groups

Focus groups involve visitors participating in a group discussion in which a series of targeted questions is asked. The goal is for participants to discuss their perceptions of the site and its services, and to gather feedback on potential improvements.

Focus groups ideally comprise an unbiased and diverse sample of participants, and are commonly facilitated by a third party without affiliation to the site in order to eliminate bias. Since there are relatively few participants, the results are very much affected by the individuals that make up the group. Participants should be chosen so as to collectively represent the interests of all types of visitors and potential visitors to the site.

### **Anecdotal Data from Site Staff**

Site staff members are often the best source for data about their site. This will usually take the form of qualitative data, but may also result in quantitative data based on technical analyses which may or may not have been originally performed in order to solve a transportation problem. For example, a site may have a historical video feed that was used to document wildlife adaption or environmental impacts, and that video may include time-lapsed observations of vehicles traversing the site. Site staff will be the most familiar with the existence of any library of such historical data.

### Staff Experience

The staff of a public lands site is often the first to recognize important problems and needs for improvement. Many staff work closely with visitors and are regularly faced with the challenges of day-to-day operations.

Staff members are often the first to recognize issues like long waiting lines, recurring delays, equipment problems, and visitor dissatisfaction. This feedback from staff often serves as a strong motivation to consider changes such as alternative transportation, since frustrations with current operations can prove more convincing than quantitative data.

Qualitative information on short and long-term trends in visitation patterns can be extremely valuable in tailoring alternative transportation services to meet demand. For smaller sites where quantitative data might be insufficient to calculate reliable trends, staff input may be the only way to approach this effort.

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<sup>7</sup> Federal Transit Administration. *Transportation Planning Process in Transit in Federal Land Management Agencies*. [http://www.triptac.org/Documents/RepositoryDocuments/tran\\_pl\\_guide\\_vol3.pdf](http://www.triptac.org/Documents/RepositoryDocuments/tran_pl_guide_vol3.pdf), p. 6-1.

### Professional Judgment

Professional judgment refers to the valuable knowledge and experience of those involved with the forecasting effort. This experience is not at all limited to demand forecasting or transportation planning. Familiarity with the site, the visitors, and the locale are extremely important assets, and no forecasting effort can be considered realistic without this input.

Some aspects of forecasting – those for which data are difficult to collect or interpret – depend especially heavily on professional judgment. When measurements cannot be relied upon, the best solution is often a simple judgment call by a knowledgeable person. Examples could include a ballpark estimate of peak parking lot occupancy, an assumption that weekend visitors spend longer on site than weekday visitors, or determining an approximate time-of-day distribution of visitor trips.

In some cases, an entire ATS demand forecast may simply be a professional estimate. This is sometimes the only feasible option for low-budget services or unusual new projects, for which relevant data are unavailable or difficult to apply.

Perhaps the most critical application of professional judgment is in validating the results of a demand forecasting effort. No matter how the effort was carried out – a simple ballpark estimate or a complex travel model – the results must be reviewed by those qualified to assess accuracy, realism, and relevance.

For larger modeling efforts, this task is often performed by a panel of experts – some with local knowledge, some with forecasting expertise, and some with political involvement or general transportation experience. For smaller efforts, this task may fall to a single person who is familiar with the site.

### **Data from External Sources**

While data specific to the site or transportation system under study are always desirable, the value of preexisting external data and the experiences of other sites should not be overlooked. Where applicable, this knowledge can provide unique insights and reduce the need for costly data collection efforts.

This approach is especially important for sites with limited data or limited history with ATS. Rather than undertaking major efforts to collect all new data, these sites can look to sources such as the U.S. Census, state and local transportation authorities, and “peer locations” – federal public land sites or other recreational areas with similar characteristics to the site under study. The kinds of peer location data most useful in forecasting transportation demand include:

- Road and parking usage;
- Transit ridership;
- Visitation and travel patterns;
- Time distributions; and
- Anecdotal input.

External data can be applied to varying degrees. Some forecasting efforts go so far as to use a peer site's overall ridership percentage as an approximation for their own, with no further refinement. For example, a historic park trying to predict demand for a proposed shuttle service may learn that 15% of visitors use transit at another nearby historic park. If the parks are similar enough, and no additional information is available, it may be reasonable to assume 15% ridership for the proposed transit service as well.

Other forecasting efforts use peer location data to develop estimates, refining their forecasts further by considering other data from their own site sources and details unique to their own service. If, for example, the historic park described above found that it received 10% more elderly visitors than the peer location, and those elderly visitors may be more inclined to use transit, the transit demand estimate could be adjusted higher.

Even when peer data may not be directly applicable, traveler behavior at peer locations can provide valuable insights into many issues affecting transportation demand. Data regarding changes to service are particularly helpful, since they can very clearly demonstrate the impacts of specific service factors such as cost and schedule.

For example, a history of bus fare and ridership at a particular site provides an excellent study in traveler sensitivity to fares. A large drop in ridership following a small fare increase can indicate that visitors are extremely sensitive to fare changes, a finding that should be considered carefully when setting fares.

## Golden Gate National Recreation Area - Alcatraz Island

For federal land units located on islands or otherwise separated from the mainland, ferries often constitute the only means of visitor access. In these instances, demand is roughly equal to total visitation. However, there are plentiful opportunities for units operating ferry services to assess whether services are attracting a desired level of demand.

Alcatraz Island in San Francisco Bay, part of the Golden Gate National Recreation Area, conducted a comparability analysis to determine whether the rates its concessionaire was charging were reasonable and appropriate. The study looked at other ferry services, both in the Bay Area and across the nation, and compared vessel characteristics (type, age), trip characteristics (travel time, customer demographics), location, terminal facilities, and other service characteristics such as reservation systems and food service.

Although Alcatraz conducted a study to critique its existing service, units with potential or proposed systems can conduct similar analyses to best structure new systems to attract customers. By studying comparable systems, units can determine the fare structures, operating characteristics, and vehicle types most suitable to their own setting.

Features	Concessioner Alcatraz Island	Alameda/Oakland Ferry	Angel Island/Tiburon Ferry	Blue and Gold Tiburon Ferry	Casco Bay
Restrooms	Yes	Yes	Yes	Yes	Yes
Food Service	Yes; extensive	Yes; hot/cold beverages, pastries	No	Yes	No-soft drink machine only
Bar	Beer and Wine on departure from Alcatraz Island	Beer and Wine	No	Yes	No
Audio/Visual Media	Plasma TV and Audio	Limited	CD/Stereo	Live Narration	No
Climate Control	Heat; one vessel with A/C	Heat	Heat	Heat	Heat
Reservations	Yes	Groups Only	Groups Only	Yes	No

*By investigating the service characteristics of comparable services, units can gain insight into how their own services can be improved to attract more customers.*

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<sup>8</sup> John A. Volpe National Transportation Systems Center. *Golden Gate National Recreation Area, Alcatraz Island, Ferry Transportation Comparability Analysis*. Prepared for the National Park Service. August 2007, p. 5.

## Considerations for Estimating ATS Demand on Public Lands

The considerations by which a site may wish to estimate its ATS demand can be narrowed down to three major categories: service characteristics, visitor characteristics, and site-specific characteristics.

- Service
  - What does the service cover? Consider attractions, parking lots, and external locations.
  - How does the service run? Shuttle, circulator, narrated tour?
- Visitation
  - Trip purpose – what do visitors come to see and do?
  - Length of visit
  - Economics – how sensitive are visitors to monetary costs?
- Site-specific
  - What kind of site is it? Nature, historic, scenic?
  - What are the primary attractions and how long do visitors typically spend at them?

The remainder of this report describes these considerations in greater detail, and, in particular, the relationship of each consideration to overall demand estimation, which in turn will assist federal public land sites in developing ATS services that are better suited to their needs.

## IV. ATS DEMAND CONSIDERATIONS: SERVICE

The following three frameworks detail conditions under which a transit service may operate. Although service characteristics within each of these three categories can greatly vary between sites, the frameworks are defined in such a way as to capture the variables and circumstances that most greatly influence the level of ridership a service may attract. Subsequent travel patterns and service characteristics defined in this chapter will all impact the ability of a transit service to draw passengers; however, these three groupings play a primary role in distinguishing how visitors respond to federal public land site transit services.

### Voluntary Service

A voluntary service supplements the option to use a personal vehicle at a site. The percentage of visitors who will utilize a voluntary service, also known as “mode share,” is generally low, but can be significantly higher if parking is hard to find or if the service quality is high. Unless there is a significant impediment to driving to the site, the demand for this type of service can be expected to be low, perhaps only 5 to 10 percent of total daily visitors.<sup>9</sup>

### Overflow Service

This type of service is designed to accommodate only a portion of the visitors to and from the site in times when the existing transportation system becomes strained. The capacity of the existing transportation system is usually constrained by the parking supply, though congestion at entrance booths or as part of the general circulation patterns throughout a site may also imply a need for overflow service. The key to a successful overflow service is to be able to provide a visitor experience that is better than the visitor would experience by remaining in a personal vehicle. This may be the result of interpretive elements provided as part of the overflow service, or the ability to bypass congestion, thus achieving time savings.

To estimate the potential need for overflow service, the expected visitor demand is first forecasted. If the forecasted demand exceeds the capacity of the existing transportation system, then an overflow service may be beneficial. The service ridership needed to avoid overflow parking or excessive traffic congestion is then estimated, and visitor access measures are taken to shift excess demand to the transit service.

### Mandatory Service

Mandatory services generally serve all visitors. For sites with existing mandatory services, system demand is assumed to be equal to the existing (or forecast) visitation level. For a site considering implementation of a mandatory service, a thorough demand study will be needed.

## **Travel Patterns**

Five major service types for transit and other forms of alternative transportation within federal public land sites have been identified. The majority of transportation services within federal public land sites fit into one of these categories.

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<sup>9</sup> Federal Transit Administration and Federal Highway Administration. *Federal Lands Alternative Transportation Systems Study: Summary of National ATS Needs*. [http://www.fta.dot.gov/documents/3039\\_study.pdf](http://www.fta.dot.gov/documents/3039_study.pdf), p. A-8.

### Primary Access

Sites where all, or nearly all, personal vehicle access is prohibited are considered to have fully exclusive transit service. At these sites, there is no way to access the site other than via transit. Transit demand at these sites is therefore equal to visitation. Environmental considerations are often cited as the reason for imposing this type of service, as allowing personal vehicle access may threaten efforts to preserve resources. Additionally, many ferry services for federal public land sites situated on islands will fall into this category. While the characteristics of a fully exclusive transit service can undoubtedly affect visitation, the demand for alternative transportation cannot be separated from the demand for visitation to the site.

Sites which allow some personal vehicle access but impose significant restrictions are considered to have partially exclusive transit service. Often disabled and/or overnight visitors may be allowed to drive their personal vehicle to the site, or access may only be allowed during times of low activity. Typical motivations for imposing access restrictions include environmental health, visitor experience, safety, congestion, and site capacity.

Under such restrictions, visitors who choose not to use ATS may have to alter their plans significantly if they are not informed in advance. The choice is not simply that of travel mode; it may have a major impact on activities and schedules as well.

### Limited Restrictions

Some sites offer parking options for visitors but may not be able to meet demand for parking spaces at all times. Parking lots may not be able to be expanded due to insufficient space, resource protection, or existing traffic congestion. In these instances, a transit service may be instituted to transport visitors from a satellite parking location to a specific assembly point, such as a visitor center.

Careful coordination is necessary to ensure visitor expectations are met in this arrangement. As many visitors have arrived at a site with the expectation of parking their vehicle at a desired location, they may view using a shuttle service as a great inconvenience. The total time spent using the service must be kept to a minimum. Visitors should also not be directed past the satellite parking location to only encounter a lack of parking options beyond. This often requires a coordinated effort using staff labor or technological deployments such as traffic counters and variable message signs to ensure that vehicles are not directed towards parking lots already at capacity.

Communicating parking limitations to visitors prior to their arrival will help visitors familiarize themselves with service characteristics and plan trips accordingly. This can be achieved through posting information on a site's website, using traveler information technologies such as dynamic message signs and highway advisory radio, and staff interaction with visitors both at entrance booths and inside visitor's centers.

## Eugene O'Neill National Historic Site

The Eugene O'Neill National Historic Site (EUON) in Danville, California, the former home of the Nobel Prize-winning playwright, faces access restrictions due to the unique location of the unit. As part of an agreement with the gated community the house is situated within, visitors are only allowed to access the site via a free shuttle bus.

To contain the flow of visitors arriving via the shuttle, EUON incorporated an advanced reservation system to ensure that demand would not exceed the capacity of the site's 18-passenger compressed natural gas (CNG) vehicle. Although the shuttle picks up visitors at a defined location, this is only disclosed to visitors after they have made reservations, thus reducing the number of visitors desiring to board the service without first reserving. Recently, the park began "no-reservation" Saturdays, but early indications find that this has not placed a strain on vehicle capacity. EUON's 18-passenger van is owned by the unit, although it leases other, smaller-capacity vehicles which can also be used to transport visitors, among other uses.

By using an advanced reservation system, EUON ensures that the vehicle operating the shuttle service is adequate to meet capacity. Additionally, the system allows the park to follow the terms of its agreement with the community while better accommodating visitors upon their arrival at the site.



*The Eugene O'Neill National Historic Site requires visitors to utilize a free shuttle service to access the unit.*

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### Circulation to Interpretive/Recreational Sites

Larger federal public land sites with multiple attractions spaced apart may consider implementing a transit service to shuttle visitors between sites. This type of service may help reduce traffic and parking congestion at FLMA's by offering convenient travel between attractions, typically for the benefit of visitors.

More than just a transportation service, a circulator offers federal public land sites an opportunity to conduct interpretive tours for passengers visiting cultural and historical attractions within a site. Visitors may be attracted by the opportunity to learn more about a site and its history beyond static exhibits at attractions. Under this arrangement, a visitor center may serve as a base of operations for visitors to consult timetables and learn more about tour programming.

<sup>10</sup> National Park Service. <http://www.nps.gov/euon/planyourvisit/guidedtours.htm>. 2011.

Accommodating the special needs of recreational users such as bicyclists and hikers is a crucial consideration in the case of recreational shuttle services. Ample space to store equipment, whether through the provision of bicycle racks or on-board space for backpacks, should be provided. This could also mean deliberately running service at reduced loads to ensure sufficient capacity for all visitors. Otherwise, the possibility exists for services over capacity towards the end of the day, which may result in visitors becoming stranded.

#### Connection to Gateway Community/Regional Nodes

At federal public land sites where on-site accommodations are limited or prohibited, establishing a transit service to nearby gateway communities or other tourist centers allows visitors to access a site without using a personal automobile. Such services range from essentially two-way connections between nearby communities and federal public land sites, to circulator services connecting many locations within a gateway community to a site, and to long-distance connections with larger cities. Many federal land transit services, such as those at Zion National Park<sup>11</sup> and Sequoia & Kings Canyon<sup>12</sup>, employ this type of arrangement.

Although federal public land sites involved in this arrangement may not completely prohibit personal vehicle access, services are typically organized in a manner that easily links popular visitor lodging facilities and congregation spots. Coordinating service with other local attractions in a gateway community can help harbor stakeholder investment in a service. Costs are often split between sites, gateway communities, and even local businesses and other tourism interests in such an arrangement. For voluntary services, the ability to promote these services, especially among non-FLMA tourism employers, is instrumental in attracting ridership.

#### Network Connecting Federal Public Land Sites or Nearby Attractions

While not as prevalent in practice as the other four service types, transit services connecting multiple federal public land sites or connecting with cultural, historical, and recreational attractions caters to visitors spending many days and visiting multiple attractions in an area. A key factor in the viability of these services is the ability of each of several locations to draw interest from the same visitors, and for each to be spaced far enough from one another to make a shuttle service feasible. This type of service may be practical for recreational sites, where visitors are likely to spend longer periods of time at each location. This can also work well at urban historic sites, which may be clustered geographically.

### **Other Service Characteristics**

In addition to the travel patterns of federal public land site transit services, the following service characteristics can also influence ridership.

#### Travel Time

Travel time represents the total time needed for a passenger to complete a one-way trip on a transit service. Operators calculate travel time by measuring the time passengers spend getting to a stop, waiting for a vehicle, traveling on the vehicle, and walking from the vehicle to their final destination. For voluntary services, the total time elapsed must remain competitive with similar trips using a personal automobile. A commonly used rule-of-thumb dictates that the ratio of transit travel time relative to

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<sup>11</sup> National Park Service. <http://www.nps.gov/zion/planyourvisit/zion-canyon-shuttle-system.htm>. 2011.

<sup>12</sup> National Park Service. <http://www.nps.gov/seki/planyourvisit/publictransportation.htm>. 2011.

automobile travel time must not exceed 1.5 in order for transit services to remain competitive.<sup>13</sup> In other words, the total travel time using a transit service should be no more than 50% higher than the total travel time for using a personal automobile.

An important consideration for federal public land sites is that visitors typically have more time set aside to carry out trip purposes and may be more agreeable to using a transit service, whereas passengers of traditional commuter transit services may have more time considerations related to work or family commitments. In other words, visitors to federal public land sites are on schedules less strict than are passengers on traditional transit services.<sup>14</sup>

### Frequency

Service frequency, also commonly referred to as headway, denotes the occurrence at which at a transit service will operate. It is measured in the number of minutes between departures at a transit stop. Frequencies can be adjusted by increasing or decreasing the number of trips over a time period. Operators must weigh visitor demand for transit services with acceptable vehicle passenger loads, as well as operating costs to determine appropriate frequencies for services.

It is widely accepted that a service must operate at least once per hour to attract voluntary ridership at low volumes. Frequencies of ten minutes or less lead to higher ridership and greater convenience for passengers, as it is generally not necessary to consult a schedule under these conditions. For frequencies greater than ten minutes, instituting “clock frequencies” allows passengers to easily understand and remember when services will arrive. Clock frequencies are designed to serve stops at specific times throughout the day, such as every 15 and 45 minutes past the hour.<sup>15</sup> If schedule reliability is of particular interest to the site, they may adjust their schedules to allow for more time to complete a route. This may occasionally entail waiting, or “idling,” at a particular stop for a few minutes, but if conveyed to visitors effectively, this reliability can be a strong selling point to encourage ridership.

### Fare

The fare charged by a transit service can be an important determinant of ridership. Many transit operators at federal public land sites offer fare-free services to attract higher ridership. It has been observed that the absence of fares can attract 50% more ridership than if a fare is charged.<sup>16</sup> Charging fares may not be necessary if dedicated sources of funding exist. Many sites charge recreation enhancement fees to all visitors; the cost of offering a transit service may be included in this.

If fares are charged, operators must account for the effects pricing plays on different visitor groups. For instance, a passenger traveling alone may not mind paying a fare, but the cost of boarding for families with children may discourage their usage of a service. A variable fee structure that varies according to time of day, day of week, or time of year may allow operators to achieve greater efficiencies, such as through reduced fares to population segments like children and senior citizens or during times of low ridership. Additionally, strategies such as day passes can attract ridership among certain user groups.

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<sup>13</sup> Federal Transit Administration. *Transportation Planning Process in Transit in Federal Land Management Agencies*. [http://www.triptac.org/Documents/RepositoryDocuments/tran\\_pl\\_guide\\_vol2.pdf](http://www.triptac.org/Documents/RepositoryDocuments/tran_pl_guide_vol2.pdf), p. 3-5.

<sup>14</sup> Ibid, p. 3-7.

<sup>15</sup> Ibid.

<sup>16</sup> Ibid.

The method utilized for collecting fares also impacts passenger experience. Particularly for shorter trips, increased time spent processing fares may deter a visitor from using the transit service again in the future. Automated fare collectors and prepaid fare systems are among the many options employed by transit agencies to expedite fare collection.

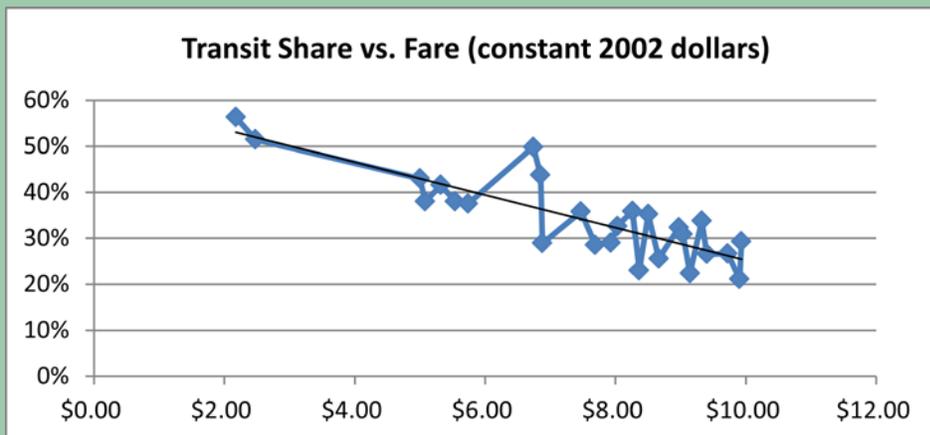
### Inyo National Forest and Devils Postpile National Monument

The Reds Meadow Valley Recreation Area in California is co-managed by the U.S. Forest Service (Inyo National Forest) and National Park Service (Devils Postpile National Monument). Since 1979, a shuttle service has provided access to several popular outdoor areas within the Reds Meadow Valley. With limited parking areas and only a single narrow road leading into the valley, restricting personal vehicle access has become necessary.

During the shuttle’s operating hours, all visitors are required to ride except those with disabilities or paid exemption for watercraft launching or overnight camping. Any others who wish to drive their personal vehicles must arrive before or after the shuttle’s operating hours.

Visitation and ridership records from the service provide insight into the effects of fare changes. Over the shuttle’s history, fares have varied from as little as \$1 to as much as \$9. Adjusted for inflation, the highest fares were approximately five times higher than the lowest fares.

When fares were lowest, ridership reached as high as 55% of all visitors. When fares were highest, ridership dipped below 25%. Visitors also responded quickly to drastic fare changes. For example, a 400% fare increase in 1981 led to an immediate loss of 59% of shuttle riders.



*Effect of fares on percentage of visitors riding shuttle bus to Devils Postpile National Monument*

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<sup>17</sup> National Park Service Public Use Statistics Office. <http://www.nature.nps.gov/stats/>. 2011.

### Trip Length

The total length of the trip (the distance between passenger boarding and arrival) can influence visitor willingness to use a transit service. Longer trips may be better able to attract ridership than shorter trips, since the initial inconvenience of arriving at a transit stop and waiting for a vehicle can be better absorbed into the total travel time of the trip. For example, a visitor is less likely to board a transit vehicle for a short trip if considerable time is exhausted traveling to the stop or waiting for a vehicle to arrive, as time saved and convenience from the trip will not be able to compensate for the time lost initially. A longer trip will absorb this lost time better, with the initial inconvenience overshadowed by the benefits accrued from using the transit service.<sup>18</sup>

### Marketing

In order for a transit service in a federal public land site setting to maximize potential ridership, visitors must first be aware of the service and the benefits of using it. Ideally, this information can be conveyed prior to the visitor arriving at the federal public land site so that they may plan accordingly. Marketing campaigns can communicate information such as schedules, routes, and fares. Continued reminders of the existence and utility of a transit service while on-site at the site are also essential.

A site's website and social media platforms are excellent resources for dissemination of information to prospective visitors, particularly if that information is easy for visitors to find and understand. Information to reduce confusion when first using a service, such as routes and service frequency, will greatly facilitate transit use. Visitors can also be persuaded to use transit services through other traveler information platforms, such as static or electronic message signs, highway advisory radio, brochures, or joint efforts with local tourism businesses to develop promotional material. As many visitors will ride the service only once or twice, transit providers should be especially careful to present service information in a method which is simple for visitors to remember.<sup>19</sup>

### Circulation Pattern

The configuration of a transit route within a federal public land site plays a major factor in a visitor's willingness to use a service. Many federal public land sites feature layouts which require visitors to enter and exit at one point. These designs are conducive for transit services, as they allow visitors to backtrack to where they first boarded a vehicle, at which point they can return to their car or place of lodging. Conversely, sites which feature a more "through" pattern are designed for visitors to depart at a different location than which they entered. There may be less of an obvious benefit for a visitor to use a transit service in this configuration, as considerable time may be expended on returning to the service's starting point.<sup>20</sup> However, visitation characteristics such as length of visit (especially for overnight visits at commercial lodging within or nearby a site), and other geographical considerations (such as the presence of multiple through roads), may make this type of travel pattern as viable for transit as more "looped" configurations.

### Span of Service

The daily hours a transit service is in operation will correspond with the operating hours of a site for mandatory services. Even for voluntary services, it may be advisable to provide service throughout all operating hours to ensure visitors are not stranded at the end of the day. This may be especially

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<sup>18</sup> Federal Transit Administration. *Transportation Planning Process in Transit in Federal Land Management Agencies*. [http://www.triptac.org/Documents/RepositoryDocuments/tran\\_pl\\_guide\\_vol2.pdf](http://www.triptac.org/Documents/RepositoryDocuments/tran_pl_guide_vol2.pdf), p. 3-2.

<sup>19</sup> Ibid, p. 3-4.

<sup>20</sup> Ibid, p. 3-2.

important at sites with campgrounds and multi-day hiking opportunities, where visitors may begin and end hikes at early morning or late evening hours. Operating services over expanded hours could lead to services operating well below passenger capacities, but the alternative of not providing services throughout the day may limit the number and type of activities a visitor can complete in a given day, and thus has a negative effect on visitor experience. Sites planning to use shuttles for interpretive tours may select specific times of the day to conduct services which accommodate peak daily demand.

Operators may choose to offer different levels of service throughout the week. For instance, voluntary services might only be offered on weekends at sites where weekday visitation does not merit the provision of service. In some cases, Fridays and Mondays may also merit more frequent service due to the spillover effect of visitors on long weekend trips. Additionally, services may be offered throughout all days of the week, yet with higher frequency on days of increased visitation. As a general rule, a site should not operate more than two service frequencies in a given week, as more complex schedules are difficult to operate and to communicate to visitors.

Many FLMAs only operate transit services during peak visitation seasons, or scale back services in shoulder seasons or other low visitation time periods. Configuring an annual span of service to match high visitation seasons can ensure services are running at or near capacity while alleviating traffic and parking congestion. However, services operating during times of low visitation risk not attracting enough passengers, especially if traffic and parking congestion is not present. To avoid confusion, many sites tailor service seasons to correspond to major holidays or the beginning or end of a particular month.

### Vehicle Characteristics

The type of vehicle used in a transit service and the characteristics it possesses can either enhance or detract from the visitor experience. Vehicles used must be able to manage expected passenger loads at an appropriate standard of comfort while offering features amenable to visitor expectations. Federal public land sites operate many types of buses in services across the nation, including low-capacity vehicles such as passenger vans, conventional transit buses, and high-capacity vehicles such as trams. The use of a novelty vehicle, such as a replica trolley bus, can become part of the visitor experience and impact ridership. Similar considerations also apply for other transit modes, such as ferries or trains.

In considering which characteristics of a vehicle may impact ridership, operators must take into account the intended purpose of the service. Interpretive tours often use vehicles designed to maximize comfort, provide the passenger with clear visibility through large windows, and are equipped with audio/visual systems for recorded or guided narration. The absence of these or other provisions may deter visitor use of a voluntary service. For shuttle services, low-floor vehicles can facilitate quicker loading/unloading times, and luggage or equipment space may be desired by recreational visitors with gear. The configuration of the bus, including door locations, seating types, air conditioning, in-vehicle electronic features (such as on-board annunciation for stops) and accessibility features can also influence ridership.<sup>21</sup>

Upkeep of vehicles is also an important attribute of successful systems, and safety and security features such as on-board cameras and bright lighting can improve visitor perceptions of a service. The external appearance of vehicles can play a role in promoting ridership by giving the service a more professional look and feel.

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<sup>21</sup> National Park Service. *Alternative Transportation System Vehicle Procurement Guide*. p. 14.

## Transit Stop Features

Transit stops represent more than just collection points for visitors to get on or off transit vehicles. Often, a visitor's arrival at a transit stop will be their first experience with a transit system. As a result, the attractiveness of a transit stop influences visitor impressions of transit services, and may attract or detract from ridership figures. Properly designed, well-maintained, and information-rich stops will help cultivate a positive image. As transit riders commonly rate the time spent waiting for a vehicle as more inconvenient than the time spent riding in one, amenities such as information kiosks, interpretive signage, schedules and system maps, real-time arrival information, protective shelters, benches, and trash receptacles can improve their experience.<sup>22</sup>

The Transit Cooperative Research Program's report *Elements Needed to Create High Ridership Transit Systems* features a table which matches commonly seen amenities at transit stops with daily customer boarding activity.<sup>23</sup>

Table 5-7: Example of Bus Stop/Shelter Amenities Standards

Amenity	Customer Boarding Activity per Day				
	< 50	50-100	100-300	300-500	Over 500
Level concrete pad	✓	✓	✓	✓	✓
Safe access	✓	✓	✓	✓	✓
Adequate lighting	✓	✓	✓	✓	✓
Bus stop signs	✓	✓	✓	✓	✓
Route map and schedules	✓	✓	✓	✓	✓
Standard shelter		✓	✓	✓	✓
Trash receptacle		✓	✓	✓	✓
Detailed schedule			✓	✓	✓
Larger/Multiple shelter(s)			✓	✓	✓
Benches in shelter			✓	✓	✓
System map				✓	✓
Real time travel information				✓	✓
Potential conversion to transit center					✓

Source: WMATA Regional Bus Study

This table may be of use to transit providers in determining transit stop designs in light of possible budgetary constraints. An important factor in designing transit stops in recreational settings is that in the event of inclement weather, visitors may not be able to return to a shelter (such as an office or residence) as readily as traditional transit customers. The provision of adequate shelter to protect against the elements may be in higher demand in a federal land setting.

## Contract/Management Arrangements

The cost of purchasing and responsibility for operating a transit vehicle in a federal land setting do not have to be borne fully by a site. Instead, many federal public land sites partner with commercial vendors to run transit services. Additionally, sites often have the option of purchasing or leasing transit vehicles,

<sup>22</sup> Federal Transit Administration. *Transportation Planning Process in Transit in Federal Land Management Agencies*. [http://www.triptac.org/Documents/RepositoryDocuments/tran\\_pl\\_guide\\_vol2.pdf](http://www.triptac.org/Documents/RepositoryDocuments/tran_pl_guide_vol2.pdf), p. 3-11.

<sup>23</sup> TranSystems Corporation, Planners Collaborative, Inc., and Tom Crikelair Associates. *Elements Needed to Create High Ridership Transit Systems: Interim Guidebook*. [http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp\\_webdoc\\_32.pdf](http://onlinepubs.trb.org/onlinepubs/tcrp/tcrp_webdoc_32.pdf), p. 5-33.

either on their own or through a contractor. Use of a commercial vendor to manage a transit service can influence factors such as fares and public image, which may impact ridership.

The foremost benefit of utilizing a commercial vendor to operate a transit service is that a vendor can bring experience and successful business practices to an operation, whereas a federal public land site may lack knowledge in transit operations.

Potential shortcomings of contractor-run services can center on a vendor's unfamiliarity working within a federal land setting. Guided tours may be difficult to operate without the use of site staff, and the absence of site staff members infringes upon visitors' ability to ask questions or receive interpretive information. Writing and managing contracts can prove to be a difficult task requiring a diverse skill set. Contractual obligations may also restrict a site's ability to adjust service to reflect changing transportation needs.<sup>24</sup>

### Service Reliability

Rider satisfaction can be heavily influenced by service reliability. Transit services which have difficulty adhering to published schedules risk alienating passengers from employing services in the future. For mandatory services as well as services with long frequencies, service reliability is essential. An accepted figure for urban transit systems is to operate 95% of runs within five minutes of schedule, with vehicles never departing ahead of schedule.<sup>25</sup>

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<sup>24</sup> Ibid, p. 3-25.

<sup>25</sup> Federal Transit Administration. *Transportation Planning Process in Transit in Federal Land Management Agencies*. [http://www.triptac.org/Documents/RepositoryDocuments/tran\\_pl\\_guide\\_vol2.pdf](http://www.triptac.org/Documents/RepositoryDocuments/tran_pl_guide_vol2.pdf), p. 3-4.

## V. ATS DEMAND CONSIDERATIONS: VISITATION

Estimating demand for non-mandatory alternative transportation services should include an evaluation of the types of visitors attracted to a particular federal public land site, and their respective likelihood for using such a service. Visitor groups cannot be easily categorized, as they come in all different forms (e.g. individuals, groups, families) with varying motivations and tolerances for using a transit service. The visitor type categorizations presented below are not meant to encompass the full scale of visitors, but rather to provide some basis from which generalized demand estimation considerations can be made.

### Those Unlikely to Use Services

There are many possible explanations for visitor unwillingness to utilize an ATS. Mobility constraints may limit the amount of activity one may endure when using a transit system, or may require equipment (e.g. wheelchairs) that makes utilizing a system more challenging and therefore less appealing. While a transit service may make for a more pleasurable visitor experience, it generally cannot compete with the personal automobile on the critical factor of time, especially among visitors who value their time highly. With a transit service, there is the probability of spending time waiting for vehicles to arrive and having to make intermittent stops along the route. Schedule reliability can help mitigate this concern, but many visitors may perceive transit as being unreliable or unsuitable based on either past experiences or an unfamiliarity with transit services in daily experiences.

The comfort and convenience of the personal automobile may also trump any ATS for a large percentage of visitors, particularly families and those heavily encumbered by equipment such as hikers and beachgoers. The automobile provides many amenities when following a self-guided itinerary, perhaps most importantly the access to personal belongings such as food and clothing. Additionally, possession of a personal automobile enables visitors to arrive at and depart from attractions at their convenience, which may be desired despite existing traffic and parking congestion.

### Those Who Could Potentially Use Services

Many visitors arrive at federal public land sites with very few expectations and are willing to “go with the flow.” If upon entering a federal public land site visitors notice the majority of visitors preparing to utilize an ATS, many visitors will often follow suit. The popularity of an ATS is tied heavily to perception, and if it is clearly demonstrated that an ATS is popular, it will breed additional usage.

This type of visitor experiences some of the same mobility issues, time constraint concerns, and personal preferences profiled above, but these may be somewhat muted. For example, they may have a more open-ended itinerary that provides for some flexibility, and may possess equipment (e.g. backpacks, water bottles) allowing them to leave their personal vehicle behind for an extended period of time.

When estimating demand for an ATS, a federal public land site must consider how to attract this impressionable visitor type. This visitor type is one that may be swayed through successful marketing efforts, word-of-mouth, and interpretive elements. Overall ATS demand is highly dependent on making a strong impression upon these visitors arriving at a site with an open mind about how they will get around to sites within the site.

### Those More Likely to Use Services

The third visitor type can rather easily be persuaded to utilize an ATS. This may relate to an interest in environmental conservation, a zest for new experiences, or a preference against driving if other options are present. The visitor may have positive past experiences using ATS in a federal land setting, and see an ATS fulfilling their itinerary better than a personal automobile would. These visitors have fewer mobility and time constraints, and are cognizant of the overall visitor experience and how the ATS may help to improve upon that experience by allowing them to sightsee instead of drive, for example.

### **Arrival Modes**

Visitors will arrive to a federal public land site by a variety of means. The mode of arrival can affect ATS ridership in positive and negative ways.

#### Automobile

The personal automobile is by far the most common mode of access to federal public land sites. There are many benefits to the use of a personal automobile. They can carry many people and their respective belongings, they allow for personalized settings and climate control, and provide flexibility in adjusting itineraries. Save for federal public land sites easily accessible via regional trail or transit systems, it can be expected that most visitors will arrive at a site in their personal automobile.

There are disadvantages to utilizing personal automobiles on federal lands, many of which may not be easily evident to visitors. The rough terrain on some site roads, owing to climate conditions, adherence to context sensitivity, and resource preservation, may damage vehicle components and threaten visitor safety. Vehicles may not be able to adequately transport large recreational items such as bicycles, kayaks, boats, and skis. Parking and traffic congestion can waste visitor time and, at its worst, prevent visitors from accessing particular attractions within a site or a site altogether. Finally, the emissions from personal automobiles can impact the health of natural habitats and resources, an important consideration for site staff.

Despite these disadvantages, visitors overwhelmingly utilize personal automobiles to access federal public land sites, even if accessibility within a site is prohibited or discouraged. Sites do have influence in convincing visitors to transfer from their vehicles upon reaching a site by communicating the disadvantages of personal vehicle utilization and advantages of ATS. For example, if visitors are unaware of rough terrain and the potential wear and tear on their vehicle as a result, then they will not be dissuaded from using their car. Likewise, if there is no warning or expectation of congestion, then the visitor will not make decisions based on that occurrence. Still, many visitors may be willing to accept these and other inconveniences in lieu of other solutions.

#### RV/Camper

RVs and campers are similar to personal automobiles in many respects, while also providing a place for lodging. Differences include the difficulty of driving them on the often narrow roadways at federal public land sites, and the increased cost of fuel to transport a heavier load. If they are able to navigate site roads, visitors are less likely to utilize an ATS. The RV can be part of the experience itself, accommodating many needs such as lodging, food, and restrooms, which drivers and passengers may find difficult to part with.

### Tour Bus

Tour buses can account for a large amount of visitation, especially within the most highly visited sites. They cater to small and large groups who are willing to pay a premium for tour packages which include necessities such as food and lodging, offer interpretation or activities tailored to specific themes, and allow for the opportunity to travel with like-minded individuals. Although many of these packages aspire to provide an all-inclusive experience, tour buses may not be able to traverse certain roads at a federal public land site, leaving riders with no choice but to utilize an ATS when available.

Federal public land sites generally do not require advance notice of the arrival of tour buses. This can make it difficult for the site to adequately staff their sites to accommodate a sudden influx of visitors. This is true both in the general staffing of the site itself, and also any staffing needs specifically associated with operating a transit service. Sites located near or along major bodies of water tend to experience this issue when cruise ships come to port. Although cruise stops are scheduled, it is tough for a site to prepare for as many as a dozen or more full tour buses at one time. One place where this has been identified as an issue is at Acadia National Park in Bar Harbor, Maine.

### **Demographics**

ATS demand may fluctuate based on the age groups of visitors. Each visitor demographic type brings with them their own circumstances which may make them more or less likely to utilize a transit service, with opportunities existing to increase ridership if service is adjusted to better serve the needs of these visitors. A short matrix is included at the conclusion of this report to visually represent the influences specific service characteristics place on the requirements of different visitor types.

### Families and Other Groups with Children

These visitor demographic types are common users of federal public land site of all purposes. They may include casual visits by families to more interpretive or thematic attractions, extended camping or backpacking excursions among groups of two or more families, or pre-planned visits by groups of children with a parent chaperone or as part of a larger program (church group, school field trip, summer camp, etc.) As children may require added attention and care, especially at younger ages, groups with children may be less likely to utilize a transit service. By boarding a service, these groups are typically sacrificing the convenience of returning to their own vehicle, or leaving an attraction early, if an issue arises. This problem may be particularly acute for infants requiring extra care, such as diaper changes. Parents and group leaders may also avoid a transit service out of consideration for the quiet enjoyment of other passengers.

Despite these conditions, there are also factors favorable to this visitor demographic type for making use of a transit service. Cost considerations may position transit as a more affordable means to travel through a federal public land site, particularly if fares are waived or discounted for large groups. Transit also provides an opportunity for large parties to stay together when they may otherwise be drawn apart to different activities, or may be forced to arrive to the site in separate vehicles. In any arrangement, the payment of fares for individual members of families (children included) constitutes a major argument against employing a transit service and should be avoided if possible, as these costs are borne completely by group leaders rather than on an individual level.

Families traveling long distances to reach a federal public land site may also have a preference to leave behind a personal automobile after a long journey if other transportation modes are available. It can make for a better overall family experience to avoid the hassle of operating a personal automobile constantly and experience a site as the site intends visitors to see it. Services which incorporate interpretive elements may be appealing in this and other instances, such as among groups with children particularly interested in the subject matter.

#### Young Independent Adults

Adults without children have fewer dependencies, and may therefore be more likely to ride a transit service. For instance, the payment of individual fares in this instance is not as burdensome as it would be for families. The ability of a service to attract ridership for these visitors depends on the ability of the service to accommodate group itineraries. As younger adults are more likely to visit federal public land sites for recreational purposes, transit ridership may depend on whether vehicles can accommodate certain equipment such as bicycles, camping gear, and large backpacks. Other characteristics, such as whether services are designed to transport visitors to popular attractions at the times desired by recreational users, will influence the utilization of a transit service. For instance, backpackers and overnight campers may require service at early or late hours outside of a typical service schedule, and service providers desire to avoid stranding daytrippers at a location if they are expected to require transportation well into evening hours.

#### Older Independent Adults

Contingent on mobility, older adults may be heavily inclined to utilize a transit service. Many visitors in this grouping may have visited the site previously. If they used a transit service at that time, they may be familiar with the service and identify it as the most desirable way to travel. Those who had visited before a transit service was implemented may be intrigued by the ability of the service to enhance their visit to the site. The convenience of the service may also be enticing in that it reduces the work required on behalf of the visitor in seeing the site, as touring sites in personal automobiles can be mentally and physically exhausting, especially among those unfamiliar with a federal public land site. It is important that alternative transportation services be able to accommodate certain equipment for the mobility-impaired, including wheelchairs and canes, in order to attract ridership from these groups, and to conform to Americans with Disabilities Act (ADA) standards.

### **Where Visitors Come From**

The distance traveled to arrive at a federal public land site and the amount of effort and time expended to get there may affect one's propensity for ATS. Visitors traveling long distances to reach a site may never have another opportunity to visit the site, whereas those living nearby may visit on a yearly, monthly, or even weekly basis.

Frequent visitors are typically less likely to utilize an ATS, at least on a per-visit basis. While the aim of ATS may be to achieve long-term goals such as resource preservation and traffic reduction, to the visitor it may appear simply as an amenity to try out once. An ATS which provides significant ancillary benefits (congestion relief, parking fee savings) stands a stronger chance at attracting repeat visitors.

Visitors traveling from long distances, on the other hand, may have dedicated additional time to visiting the site, thus providing some flexibility in the type of experience they are willing and able to partake in. In many of these instances, visiting the federal public land site constitutes the primary purpose of an

extended vacation for individuals, who are thus willing to more completely immerse themselves in the site's offerings. A transit service would help guide these visitors throughout a site, whose layout out-of-town visitors may be unfamiliar with.

### Roosevelt-Vanderbilt National Historic Sites

Understanding the broader transportation and cultural context within which a federal land unit operates can provide insight regarding the transportation needs of its visitors. The community of Hyde Park, New York, features four NPS units: the Home of Franklin D. Roosevelt National Historic Site, the Eleanor Roosevelt National Historic Site, Top Cottage (Roosevelt's private retreat), and the Vanderbilt Mansion National Historic Site. In the past, parking and congestion issues commonly occurred at these sites, and visitation was largely limited to users of private vehicles.

With a market demographic in mind, these sites instituted a shuttle bus service that can effectively serve visitors seeking to access the area using the Metro-North rail service south from New York City. Operating between May and October, the Roosevelt Ride serves an arriving train in the morning and operates between the sites, allowing visitors flexibility in how they want to structure their day. On the website of the Home of Franklin D. Roosevelt National Historic Site, suggested itineraries are provided to prospective customers to help guide the trip planning process. No matter what program visitor groups choose to follow, the Roosevelt Ride provides transportation back to the Poughkeepsie train station at the end of the day.



*The Roosevelt Ride picks up and drops off customers at a nearby train station, providing alternative transportation access to the NPS sites in Hyde Park, NY.*

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### Trip Purpose

Owing to the diversity of federal public land sites across the country, visitors go to sites for wide variety of reasons. Sites in urban locations are typically cultural in nature, rich in interpretive information and confined to a small location, or spread out over a wider area within a community with walking opportunities between attractions. In contrast, rural sites typically offer recreational activities, such as hiking, camping, or sightseeing. While visitors typically spend no more than a day at cultural attractions, recreational sites can attract multi-day visits, with visitors lodging at campgrounds or in nearby

<sup>26</sup> John A. Volpe National Transportation Systems Center and National Park Service. *Roosevelt-Vanderbilt NHS Alternative Transportation System Implementation Plan – Phase II*. <http://www.volpe.dot.gov/coi/ppoa/publiclands/projects/docs/roosevelt-2.pdf>, p. 4.

accommodations. Sites of all types also conduct scheduled programming and special events, which can attract visitation beyond normal levels.

Under all these arrangements, opportunities for offering effective transit services exist, but service characteristics must be tailored to fit the needs of these different trip purposes. For example, hikers, campers, and other backpackers typically desire a service with ample space to store equipment, and may also desire service outside of daylight hours in order to fulfill their planned itineraries. Casual sightseers would likely be most interested in a transit service with frequent and convenient services, in order to overcome unfamiliarity with a site and so visits can fit in to broader travel plans within an area. A short matrix at the end of this report examines how the needs of different trip purposes correlate to the service characteristics of a transit service.

Sites examining the viability of launching, expanding, or improving transit services are unlikely to possess the funds or resources to implement services which can fit the needs of every potential visitor type and trip purpose. Possessing an understanding of the average visitor profile of a federal public land site, as well as when (daily and seasonally) and how these visitors arrive and what requirements they may demand, is one of the most important pieces of information sites can use in thinking about alternative transportation.

## **Macroeconomic Trends**

The broader economic climate has a strong impact in how people choose to spend their leisure time. In times of economic strain, people may not have the funds or time available to travel long distances to reach federal public land sites. For those still visiting sites, itineraries which allow for exploration at more affordable rates may be desired. Alternative transportation services which are positioned as a cost-effective way to experience a federal public land site may see increased use under these conditions, especially if the service is free or low cost as compared to any associated parking fee.

Another consequence of economic downturns is that sites may experience more local visitation, as groups may not have the resources to travel longer distances as much as before. This may manifest itself as an opportunity to visit more local federal land attractions, either for the first time or as a repeat visit.

During economic upswings, opposite reactions may be seen. With more disposable income, visitation at sites may increase, particularly among out-of-town visitors.

## VI. ATS DEMAND CONSIDERATIONS: SITE-SPECIFIC

With thousands of different federal public land sites in operation across the country, the scope of locations at which ATS may be considered is expansive. As a result, the underlying factors which necessitate consideration of whether ATS is viable are highly contingent on local conditions. The following three frameworks define the site types most prevalent across federal land agencies, and the feasibility of alternative transportation to solve their transportation issues.

### Small, Low Visitation Sites

These sites typically see no need to implement an ATS, particularly those systems that are more advanced, due to the low visitation levels these sites see at all times. These sites may be located in more rural locations which are more difficult to reach, may feature limited visitor amenities, or desire not to encourage additional visitation in order to accomplish long-term resource preservation goals.

### Medium-Sized, Peak Visitation Sites

At most times of the operational season, the need for an ATS is limited at these sites due to a lack of demand. However, these sites may experience peak visitation days, typically on weekends or during ideal weather conditions. The need for a transportation intervention may be more acute if there is limited infrastructure to accommodate additional vehicles, or if the surrounding area is unable to handle an influx of visitation without causing congestion to occur. A limited-service transit system to accommodate overflow may be most appropriate under these circumstances.

### Large, Heavy Visitation Sites

For these types of sites, heavy visitation throughout most times of the year is common. They may serve as a destination for out-of-town visitors due to popular natural or cultural features and attractions. As such, visitation is high throughout the year and there may be detrimental impacts on natural resources and transportation infrastructure. In rural locations, alternative transportation within a site may reduce vehicular traffic and enhance the visitor experience, even if there is little opportunity to curb how visitors access sites. In urban areas, there will more likely be limited opportunities to access sites via personal automobile, necessitating the need for transit or bicycle and pedestrian connections with outlying areas to better improve site accessibility.

## Site-Specific Characteristics

Site-specific characteristics of federal land sites and their surrounding communities play roles in influencing visitor willingness to utilize an alternative transportation service. This section identifies some of these characteristics, as well as the implications for ATS demand at a site.

### Weather Conditions

Local weather conditions can influence visitor willingness to use an ATS in two distinct ways. First, local climate plays a strong role in shaping annual visitation patterns. This is seen through reduced visitation levels during cold winter months or hot summer months, contingent on the setting of the site. A transit service during these seasons may not be viable. Other sites may experience peak visitation subject to seasonal and climate factors, such as during the autumn foliage season.

Second, daily weather conditions impact whether visitors will seek out an alternative transportation service. Pleasant, comfortable weather may persuade visitors to walk or bicycle to a destination rather than drive. However, poor weather conditions such as rain or stifling heat may induce transit ridership, particularly over longer distances. In these instances, sheltered waiting areas can advance the likelihood of a visitor using a transit service. During severe weather, transit vehicles can play a critical role in evacuating visitors to safe locales if their well-being is threatened.

### Site Layout

The layout and size of a federal public land site play pivotal roles when assessing the need for an ATS. Units must consider how the geographical arrangement of site attractions influences transport mode choice by visitors. A transit service is more likely to be successful if attractions are at some distance from one another, as visitors would prefer to make use of the service rather than travel on foot. In contrast, a smaller unit may feature attractions which are located relatively close to one another. In this instance, a transit service between sites may not be viable, but there may be opportunities to improve pedestrian and bicycle infrastructure.

Factors other than distance also determine what modes of transport visitors utilize between site attractions. Safety and road and trail conditions are other aspects that influence visitor decision making. For example, visitors may avoid driving on dirt roads for fear that their vehicle may sustain damage, or avoid walking if there is no trail between two nearby attractions. In the absence of access restrictions, visitors will usually choose the mode of transport most practical for their situation.

### Resource Preservation

A principal impetus for the introduction of alternative transportation systems at federal land units is to offset the negative impact that visitor activity can have on the surrounding environment. As the popularity of, and visitation to, federal land units continue to grow, already strained road systems and parking areas are experiencing elevated demand. Increasing roadway and parking capacity is no longer seen as the only viable solution, as this can consume natural areas set aside for preservation. Alternative transportation systems are serving as a practical alternative to meeting increased demand without causing harm to natural resources.<sup>27</sup> Use of these systems can be increased by offering incentives for visitors, or imposing restrictions on the use of personal vehicles within a site.

A balance is often sought at federal public land sites to allow for both visitor access and also resource preservation. This balance can be fractured by the impacts of the local environment on site transportation infrastructure. At federal public land sites with extreme weather events, assets such as roads and parking areas can sustain moderate to severe damage on a regular basis. One example of this is seen at the Cape Cod National Seashore, where erosion leaves parking infrastructure susceptible to severe damage. In these instances, alternative transportation systems may be an appropriate remedy to this issue.

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<sup>27</sup> Cambridge Systematics, Inc. and BRW Group, Inc.. *Federal Lands Alternative Transportation Systems Study: Summary of National ATS Needs Volume III*. Prepared for the Federal Highway Administration and Federal Transit Administration, in association with the National Park Service, Bureau of Land Management, and U.S. Fish and Wildlife Service. August 2001. p. 3-1.

## Cape Cod National Seashore

Many of the beaches constituting the Cape Cod National Seashore (CACO) are located in resource-sensitive areas, subject to the forces of erosion. In some locations, an average of three feet of coastline is lost annually, and significant weather events have the potential of causing even more erosion.



*Erosion at parking areas at Cape Cod National Seashore may necessitate the use of satellite parking areas and associated shuttle buses.*

As a result, parking infrastructure is subject to damage. Many parking areas will lose enough spaces to fail to meet capacity at some point over the next two decades, if historic visitor projections hold steady.

To combat this issue, CACO has examined the possibility of using satellite parking areas if and when demand at endangered lots exceeds capacity, and employing shuttle vehicles to transport visitors between satellite lots and beaches. A recent planning study examined several potential routes connecting satellite lots and beaches, analyzing figures such as projected parking space loss, short and long-term availability of parking areas, and route distance and length to recommend the most feasible options. Using current and projected visitation figures and parking lot capacities, CACO has a strong idea of the current and future deficits it faces in its parking supply, allowing it to understand the demand which exists at each beach location. This allows potential shuttle bus services to be planned accordingly.

Town	Beach	NPS / Town	Ocean / Bay	2008 Total* Spaces	2030 Estimated Spaces Needed	2028 Spaces Remaining AFTER Erosion	Future Excess or Shortfall
Brewster	Breakwater Landing	town	Bay	5	6	5	-1
Brewster	Breakwater Beach	town	Bay	59	77	59	-18
Brewster	Crosby Landing	town	Bay	63	82	63	-19
Brewster	Ellis Landing	town	Bay	21	27	21	-7
Brewster	Linnell Landing	town	Bay	24	31	24	-7

*Alternative transportation services can help the Cape Cod National Seashore make up for projected parking shortfalls which will occur as the result of erosion at current parking areas.*

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<sup>28</sup> John A. Volpe National Transportation Systems Center. *Cape Cod National Seashore Integrated Parking and Transit Study*. <http://www.volpe.dot.gov/coi/ppoa/publiclands/projects/docs/capecod2.pdf>, p. 34.

Other visitor uses play roles in damaging the surrounding environment, intentionally or not. Walkers or bicyclists straying from marked trails, causing too much noise, or leaving waste in natural areas are all negative consequences of visitor activity.<sup>29</sup> The introduction of a transit service to provide an additional mode of transport, or the improvement of existing trail systems to deter these types of behavior, can reduce damage to natural resources.

### Regional Transportation Context

Some federal public land sites, particularly those which cover large geographical areas, may contain major thoroughfares running through them. Congestion on these roads from visitors and residents may not only impair the visitor experience, but also affect economic activity in the larger geographic region. Sites may wish to look for alternative measures to decrease visitor use of these roads. This can include the installation of a transit system, construction of a bicycle/pedestrian trail, or incentives for visitors to adjust travel patterns. A well-run educational campaign, in which visitors understand the impact removing personal automobiles from these roads has on traffic levels, may further induce use of alternative transportation systems.<sup>30</sup>

Population growth on the outskirts of sites is becoming an increasingly complex issue. New development can strain site transportation infrastructure, as well as contribute to other resource preservation worries. Decreasing the level of harmful transportation activity, such as through the construction of a bicycle/pedestrian trail connecting to nearby neighborhoods, can both ameliorate these concerns and provide stronger connections to local communities.

### Community Relations

Alternative transportation services offered both within and outside of site boundaries are often operated in conjunction with local partners. Partners are able to tender expertise, labor, funding, and other resources, enabling high-value alternative transportation services to function. Services designed through strong partnerships are more attractive to visitors due to the widespread buy-in from entities visitors may interact with outside of the site. Gateway communities, and the local businesses in these settings, are good examples of service partners, as they may offer incentives for visitors to utilize a service.<sup>31</sup> Instances of partnering at Acadia National Park, Lowell National Historical Park, and Cuyahoga Valley National Park show that superior alternative transportation services are borne out of collaborative relationships with local partners.<sup>32</sup>

One example of how local support can influence the dynamics of an ATS is seen in the number of enterprises in gateway communities that market themselves to attract business in shoulder seasons. As rates for travel, lodging, and dining are typically lower in these seasons, these marketing efforts are alluring to budget-conscious travelers. The fluctuation in visitation rates may produce a bump in ridership during these shoulder seasons. Transit services may need to adjust service conditions accordingly as a result of the actions of service partners.

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<sup>29</sup> Manning, R., Lawson, S., Newman, P., Budruk, M., et al. *Environmental Impacts of Ecotourism*. London: CAB International. 2004. p. 259-272.

<sup>30</sup> Anderson, D., Lime, D., and Wang, T. *Maintaining the Quality of Park Resources and Visitor Experiences*. Cooperative Park Studies Unit, Department of Forest Resources, University of Minnesota. September 1998. p. 117-120.

<sup>31</sup> Texas Transportation Institute and Cambridge Systematics, Inc. *Innovative Transportation Planning Partnerships to Enhance National Parks and Gateway Communities*. Prepared for the American Association of State Highway and Transportation Officials Standing Committee on Planning. p. 78-79.

<sup>32</sup> National Park Service. *The National Park Service Transportation Planning Guidebook*. June 1998. p. 27-28, 32-34.

### Visitor Experience

Whether a federal public land site is focused primarily on recreation or interpretation can influence visitor willingness to utilize an ATS. Visitors of each type will have different motives for pursuing a visit, which influences the length of their visit, the number of attractions they desire to see, and how much equipment they will be carrying, among other factors. Each of these considerations can position an ATS as more or less amenable. Sites are wise to tailor characteristics of a service to their typical visitor profile. For example, a recreational visitor with hiking equipment may desire a transit service to shorten the distance of a day hike, but a vehicle without space to accommodate hiking equipment may prevent this use. Transit services at interpretation-focused sites may be agreeable to visitors wishing to experience multiple attractions over the course of a day, but infrequent service may prevent this from occurring.

Another factor which can impact visitor willingness to utilize an alternative transportation service is the cost expended to access a site, measured both monetarily and logistically. As an alternative transportation service, such as a transit system, can be seen as a component of the overall visitor experience, visitors may be more agreeable towards utilizing a service if they seek to become more immersed with the whole of a site's attractions and services. These types of visitors may have spent a great deal of money, used significant vacation time from employment, and traveled a long distance to reach a site, and now desire for the site to care for their needs to the greatest extent possible. With visits of shorter lengths, visitors may be more dismissive of a service they will not use repeatedly.

Conversely, sites which are virtually impossible to access without a personal automobile may face difficulty in drawing ridership from visitors not eager to set aside their vehicle. Sites situated near major population centers and accessible via walking, bicycling, or public transit may have a greater demand for alternative transportation infrastructure.

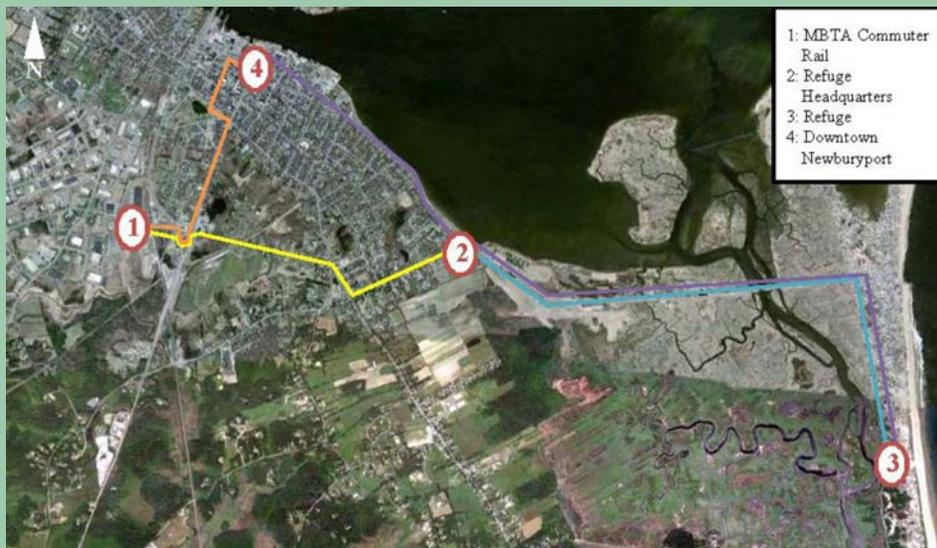
### Special Events

Some sites may see a spike in visitation at different times of the year due to special events such as a festival or holiday. If demand is expected to exceed capacity during any of these special events, then the site may wish to run additional transit services. One model that has proven successful at federal public land sites in the past has been contracting with local schools and school bus companies to provide extra service and overflow parking. Still, if such events threaten to put too much strain on the transit service or on the site as a whole, information campaigns and visitor management techniques can be deployed to spread the word and help visitors plan accordingly. These techniques not only help to reduce strain on the service, but also may curtail congestion, illegal parking leading to safety issues, and overall visitor dissatisfaction.

## Parker River National Wildlife Refuge

The beachfront at Parker River draws so many visitors in the summer months that roads and parking lots become overcrowded. Many visitors are turned away during peak hours, and some wildlife-oriented programs must be scaled back or canceled.

To combat this problem, Parker River is considering the purchase of a single bus to accommodate wildlife-oriented visitors during the busy beach season. The bus would run specifically for scheduled wildlife programs and special events, so demand for the service ties directly to demand for these sessions.



*Destinations and Routes for Shuttling Option*

A review of attendance for previous programs and special events identified an average attendance of around 25 people. Since only a few events would be expected to exceed this number, it was decided that a 28-passenger bus would be the most practical option for Parker River.

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### Tribal Issues

Federal public land sites located in proximity to tribal lands will face additional steps in attempting to implement alternative transportation solutions. Many federal public land sites are mandated to consult with local tribal governments during the transportation planning process, with tribal approval often necessary to carry a project forward. Historically, projects where construction or operation occurs within tribal lands have been difficult to implement, as tribes have often favored limited development in an effort to leave land in a natural state. Services connecting to or located near tribal historic, cultural, or archeological resources have faced similar limitations.<sup>34</sup>

<sup>33</sup> John A. Volpe National Transportation Systems Center. *Parker River National Wildlife Refuge Transit Planning Study*. <http://ntl.bts.gov/lib/41000/41800/41851/DOT-VNTSC-FWS-11-02.pdf>, p. 65.

<sup>34</sup> Cambridge Systematics, Inc. and BRW Group, Inc.. *Federal Lands Alternative Transportation Systems Study: Summary of National ATS Needs Volume III*. Prepared for the Federal Highway Administration and Federal Transit Administration, in association with the National Park Service, Bureau of Land Management, and U.S. Fish and Wildlife Service. August 2001. p. 3-9.

## VII. ATS DEMAND ESTIMATION FRAMEWORK

Given the various considerations detailed in the preceding sections, it may be easy for many of the important components to get lost in the details when sites deliberate alternative transportation systems. The characteristics of federal public land sites vary widely, thus necessitating the operating characteristics of transit services to be finely tuned to meet the needs and conditions of the site in question. The matrix featured in this section can act as a guide for federal public land sites to follow in developing transit services by matching selected site characteristics with methods by which to approach important service components.

This matrix features visitor group types along the left-hand side and service considerations along the top columns. The service considerations, composed of scheduling, accommodations (space and capacity), fares, and destinations served (or travel routes), detail the ways in which each can be adjusted in a transit service to better serve visitor group types. These descriptions are not designed to state conclusively that a service should be tailored in a specific way for a site. Rather, each site will see visitation from multiple visitor types, and by matching those visitor types which are most prevalent and most likely to utilize a transit service, the matrix can provide guidance on how services can be structured. Boxes shaded in darker colors are considered of greater importance than those shaded in lighter colors.

There is no one method to use in estimating demand for alternative transportation services at federal public land sites. Due to the extreme diversity across all federal public land sites, the viability of ATS can only be considered on a case-by-case basis. Still, there are some generalizations which can be made on how designing for and operating ATS for common visitor types can increase the likelihood of a service being utilized. The matrix attempts to present these generalizations, at least for transit services, in a more accessible manner, allowing sites to mix and match those specific conditions which best fit their situations to guide development of a transit service.

	Scheduling	Accommodations	Fare	Destinations Served
<b>Tour Groups</b>	Compatibility with broader tour group scheduling (frequent service, few delays)	Adequate capacity for all tour group members	Should be absorbed in larger cost of tour group package (no hidden fees); reduced costs for seniors; deals for large groups	Less time in transit to or at sites not on tour group itinerary
<b>Single Families</b>	Frequent service, especially through later hours of the day	Child-friendly (space for strollers, etc.); space for personal accessories (backpacks, coolers, etc.)	Low fares; reduced costs for children and seniors	Less time in transit to or at sites not on itinerary
<b>Multi-Family Groups</b>	Very frequent service throughout the day	Child-friendly (space for strollers, etc.); space for personal accessories (backpacks, coolers, etc.)	Low fares; reduced costs for children and seniors; deals for large groups	Very little time in transit to or at sites not on itinerary
<b>Group of Adults</b>	Convenient service throughout the day (easy to remember schedules)	Adequate capacity for groups to sit together; space for personal accessories (backpacks, coolers, etc.)	Fares low enough to incentivize transit over driving; reduced costs for seniors	Avoidance of excessive time in transit to or at sites not on itinerary
<b>Single Adults</b>	Convenient service throughout the day (easy to remember schedules)	Space for personal accessories (backpacks, coolers, etc.)	Fares low enough to incentivize transit over driving; reduced costs for seniors	Less time in transit to or at sites not on itinerary
<b>Mobility-impaired Persons</b>	Convenient service throughout the day (easy to remember schedules)	Accessible vehicles; accessible waiting areas; ample room for seating	Reduced or no fare	Convenient service to all accessible sites
<b>Employees</b>	Frequent service with few delays throughout the day	Space for personal accessories (backpacks, coolers, etc.)	Fares low enough to incentivize transit over driving, or no fare at all	As direct to intended destination as possible

	Scheduling	Accommodations	Fare	Destinations Served
<b>Casual Sightseeing</b>	Frequent service; convenient service (easy to remember schedules)	Space for personal accessories (backpacks, coolers, etc.); provision of interpretive information	Fares low enough to incentivize transit over driving; reduced costs for children and seniors; deals for large groups	Ample, but not excessive, opportunity to visit various attractions
<b>Daytrippers</b>	Convenient service throughout the day (easy to remember schedules); early morning and late afternoon service	Space for personal accessories and other equipment (backpacks, coolers, hiking poles, etc.)	Low fares; reduced costs for children and seniors; deals for large groups	Less time in transit to or at sites not on itinerary; ability to drop off and pick up at different locations
<b>Overnight</b>	Convenient service throughout the day (easy to remember schedules)	Space for large camping equipment (tents, hiking packs, etc.)	Low fares; reduced costs for children and seniors	Less time in transit to or at sites not on itinerary; ability to drop off and pick up at different locations
<b>Special Events</b>	Compatibility with event programming; frequent service before and after event	Adequate capacity for very large groups	Fares low enough to incentivize transit over driving; reduced costs for children and seniors	As direct to intended destination as possible
<b>Scheduled Programs</b>	Synchronicity with event programming	Adequate capacity for large groups	Fares low enough to incentivize transit over driving; reduced costs for children and seniors	As direct to intended destination as possible